CLAIMS

What is claimed is:

1. A method for evaluating accuracy of an automatic location identification (ALI) system configured to locate a wireless communication device originating a call through a wireless communication network, said method comprising:

identifying a validation region in which a service area of a public safety answering point (PSAP) and a radio frequency (RF) coverage area of said wireless communication network overlap;

selecting a test scenario that represents a calling environment in which said call may occur;

choosing a test point in said validation region exhibiting said calling environment represented by said test scenario;

determining a ground truth of said test point;

performing a test call from said test point, said test call simulating said call;

obtaining a reported location of said test point from said ALI system in response to said performing operation; and

comparing said reported location with said ground truth to determine said accuracy of said ALI system in response to predetermined accuracy parameters.

2. A method as claimed in claim 1 wherein said identifying operation comprises:

obtaining a first map of said service area;

acquiring a second map of said RF coverage area;

selecting unit areas that are common to each of said first and second maps; and

compiling said unit areas to form a validation region map identifying said validation region.

3. A method as claimed in claim 2 wherein said acquiring operation comprises:

defining a wireless service area of said wireless communication network approximately corresponding to said service area of said PSAP;

locating RF coverage holes within said wireless service area, said RF coverage holes being regions of said wireless service area exhibiting a signal strength of RF communication signals that is less than a predetermined design threshold; and

dissociating said RF coverage holes from said wireless service area to produce said second map of said RF coverage area.

4. A method as claimed in claim 3 wherein said identifying operation further comprises:

accessing a PSAP service area database to obtain said first map;

accessing a service area database of said wireless communication network to define said wireless service area;

accessing an RF coverage area database that identifies said RF coverage holes within said wireless service area; and

querying each of said PSAP service area database, said service area database, and said RF coverage area database to compile said unit areas that are common to each of said first and second maps, said unit areas exhibiting RF signal strength of said RF communication signals that is greater than said predetermined design threshold.

5. A method as claimed in claim 1 further comprising:

obtaining a validation region map of said validation region;

populating said validation region map with geographic and land use features of said validation region;

partitioning said validation region map into a plurality of sub-regions; and

correlating each of said sub-regions with one of a plurality of test scenarios, said selected test scenario being one of said plurality of test scenarios, and each of said test scenarios representing a unique calling environment in said validation region.

6. A method as claimed in claim 5 wherein said choosing operation comprises initiating a random selection process to choose said test point from within said sub-regions correlated with said selected test scenario.

7. A method as claimed in claim 5 wherein said call is an emergency call and said choosing operation comprises distinguishing said test point in response to a frequency of wireless calls previously originated within a boundary of one of said sub-regions correlated with said selected test scenario relative to said frequency of said wireless calls previously originated within others of said sub-regions correlated with said selected test scenario.

8. A method as claimed in claim 5 wherein said call is an emergency call and said choosing operation comprises distinguishing said test point in response to a frequency of

wireless calls previously conducted within a boundary of one of said sub-regions correlated with said selected test scenario relative to said frequency of said wireless calls previously conducted within others of said sub-regions correlated with said selected test scenario.

9. A method as claimed in claim 1 wherein said choosing operation comprises ascertaining that said test point is a viable test point for performing said test call, said viable test point being accessible and exhibiting said calling environment represented by said test scenario.

10. A method as claimed in claim 9 further comprising conducting a ground survey of said test point to ascertain that said test point is said viable test point.

11. A method as claimed in claim 1 wherein:

said method further comprises:

obtaining a validation region map of said validation region;

establishing an RF signal propagation model of said wireless communication network in said validation region map, said model representing propagation of RF communication signals through said validation region;

activating said ALI system within said simulated environment; and

locating said test point in said validation region map, said ground truth being determined from said validation region map; and

said performing operation comprises simulating said test call within said simulated environment to obtain said reported location of said test point.

12. A method as claimed in claim 1 wherein said test point is a first test point, said determining operation determines said ground truth of said first test point at a first instant in time, said obtaining operation obtains said reported location of said first test point at said first instant in time, and said method further comprises:

continuing said test call at a second test point;

determining a second ground truth of said second test point;

obtaining a second reported location of said second test point from said ALI system at a second instant in time following said first instant in time; and

comparing said second reported location with said second ground truth to determine said accuracy of said ALI system to track movement of said wireless communication device.

13. A method for evaluating accuracy of an automatic location identification (ALI) system configured to locate a wireless communication device originating an emergency call through a wireless communication network, said method comprising:

identifying a validation region in which a service area of a public safety answering point (PSAP) and a radio frequency (RF) coverage area of said wireless communication network overlap;

selecting a test scenario that represents a calling environment in which said emergency call may occur;

choosing a test point in said validation region exhibiting said calling environment represented by said test scenario;

determining a ground truth of said test point;

performing a test call from said test point, said test call simulating said emergency call;

obtaining a reported location of said test point from said ALI system in response to said performing operation; and

comparing said reported location with said ground truth to determine said accuracy of said ALI system in response to predetermined accuracy parameters.

14. A method as claimed in claim 13 wherein said identifying operation comprises:

obtaining a first map of said service area;

acquiring a second map of said RF coverage area;

selecting unit areas that are common to each of said first and second maps; and

compiling said unit areas to form a validation region map identifying said validation region.

15. A method as claimed in claim 14 wherein said acquiring operation comprises:

defining a wireless service area of said wireless communication network approximately corresponding to said service area of said PSAP;

locating RF coverage holes within said wireless service area, said RF coverage holes being regions of said wireless service area exhibiting a signal strength of RF communication signals that is less than a predetermined design threshold; and

dissociating said RF coverage holes from said wireless service area to produce said second map of said RF coverage area.

16. A method as claimed in claim 15 wherein said identifying operation further comprises:

accessing a PSAP service area database to obtain said first map;

accessing a service area database of said wireless communication network to define said wireless service area;

accessing an RF coverage area database that identifies said RF coverage holes within said wireless service area; and

querying each of said PSAP service area database, said service area database, and said RF coverage area database to compile said unit areas that are common to each of said first and second maps, said unit areas exhibiting RF signal strength of said RF communication signals that is greater than said predetermined design threshold.

17. A method as claimed in claim 13 further comprising:

obtaining a validation region map of said validation region;

populating said validation region map with geographic and land use features of said validation region;

partitioning said validation region map into a plurality of sub-regions; and

correlating each of said sub-regions with one of a plurality of test scenarios, said selected test scenario being one of said plurality of test scenarios, and each of said test scenarios representing a unique calling environment in said validation region.

18. A method as claimed in claim 17 wherein said choosing operation comprises initiating a random selection process to choose said test point from within said sub-regions correlated with said selected test scenario.

19. A method as claimed in claim 17 wherein said choosing operation comprises distinguishing said test point in response to a frequency of wireless emergency calls previously originated within a boundary of one of said sub-regions correlated with said selected test scenario relative to said frequency of said wireless emergency calls previously originated within others of said sub-regions correlated with said selected test scenario.

20. A method as claimed in claim 17 wherein said choosing operation comprises distinguishing said test point in response to a frequency of wireless calls previously conducted within a boundary of one of said sub-regions correlated with said selected test scenario relative to said frequency of said wireless calls previously conducted within others of said sub-regions correlated with said selected test scenario.

21. A method as claimed in claim 13 wherein said choosing operation comprises ascertaining that said test point is a viable test point for performing said test call, said viable test point being accessible and exhibiting said calling environment represented by said test scenario.

22. A method as claimed in claim 21 further comprising conducting a ground survey of said test point to ascertain that said test point is said viable test point.

23. A method as claimed in claim 13 wherein:

said method further comprises:

obtaining a validation region map of said validation region;

establishing an RF signal propagation model of said wireless communication network in said validation region map, said model representing propagation of RF communication signals through said validation region;

activating said ALI system within said simulated environment; and

locating said test point in said validation region map, said ground truth being determined from said validation region map; and

said performing operation comprises simulating said test call within said simulated environment to obtain said reported location of said test point.

24. A method as claimed in claim 13 wherein said test point is a first test point, said determining operation determines said ground truth of said first test point at a first instant in time, said obtaining operation obtains said reported location of said first test point at said first instant in time, and said method further comprises:

continuing said test call at a second test point;

determining a second ground truth of said second test point;

obtaining a second reported location of said second test point from said ALI system at a second instant in time following said first instant in time; and

comparing said second reported location with said second ground truth to determine said accuracy of said ALI system to track movement of said wireless communication device.

25. A computer-based method for evaluating accuracy of an automatic location identification (ALI) system configured to locate a wireless communication device originating a call through a wireless communication network, said computer-based method comprising:

identifying a validation region in which a service area of a public safety answering point (PSAP) and a radio frequency (RF) coverage area of said wireless communication network overlap, said identifying operation comprising:

obtaining a first map of said service area;

acquiring a second map of said RF coverage area;

selecting unit areas that are common to each of said first and second maps; and

compiling said unit areas to form a validation region map identifying said validation region;

populating said validation region map with geographic and land use features of said validation region;

partitioning said validation region map into a plurality of sub-regions;

correlating each of said sub-regions with one of a plurality of test scenarios;

selecting one of said plurality of test scenarios that represents a unique calling environment in which said call may occur;

choosing a test point in said validation region exhibiting said unique environment represented by said one test scenario;

determining a ground truth of said test point;

performing a test call from said test point, said test call simulating said call;

obtaining a reported location of said test point from said ALI system in response to said performing operation; and

comparing said reported location with said ground truth to determine said accuracy of said ALI system in response to predetermined accuracy parameters.

26. A computer-based method as claimed in claim 25 wherein said acquiring operation comprises:

defining a wireless service area of said wireless communication network approximately corresponding to said service area of said PSAP;

locating RF coverage holes within said wireless service area, said RF coverage holes being regions of said wireless service area that exhibit a signal strength of RF communication signals that is less than a predetermined design threshold; and

dissociating said RF coverage holes from said wireless service area to produce said second map of said RF coverage area.

27. A computer-based method as claimed in claim 25 wherein:

said method further comprises:

establishing an RF signal propagation model of said wireless communication network in said validation region map, said model representing propagation of RF communication signals through said validation region;

activating said ALI system within said simulated environment; and

locating said test point in said validation region map, said ground truth being determined from said validation region map; and

said performing operation comprises simulating said test call within said simulated environment to obtain said reported location.

28. A computer-based method as claimed in claim 25 further comprising executing said choosing, determining, performing, obtaining, and comparing operations for a plurality of test points exhibiting said unique environment represented by said one test scenario class.

29. A computer-based method as claimed in claim 25 further comprising:

selecting a second one of said plurality of test scenarios that represents a second unique calling environment in which said call may occur;

choosing a second test point in said validation region exhibiting said second environment represented by said second test scenario; and

executing said determining, performing, obtaining, and comparing operations for said second test point.

30. A computer-based method for evaluating accuracy of an automatic location identification (ALI) system configured to locate a wireless communication device originating an emergency call through a wireless communication network, said computer-based method comprising:

identifying a validation region in which a service area of a public safety answering point (PSAP) and a radio frequency (RF) coverage area of said wireless communication network overlap, said identifying operation comprising:

obtaining a first map of said service area;

acquiring a second map of said RF coverage area;

selecting unit areas that are common to each of said first and second maps; and

compiling said unit areas to form a validation region map identifying said validation region;

populating said validation region map with geographic and land use features of said validation region;

partitioning said validation region map into a plurality of sub-regions;

correlating each of said sub-regions with one of a plurality of test scenarios;

selecting one of said plurality of test scenarios that represents a unique calling environment in which said emergency call may occur;

choosing a test point in said validation region exhibiting said unique environment represented by said one test scenario;

determining a ground truth of said test point;

performing a test call from said test point, said test call simulating said emergency call;

obtaining a reported location of said test point from said ALI system in response to said performing operation; and

comparing said reported location with said ground truth to determine said accuracy of said ALI system in response to predetermined accuracy parameters.

31. A computer-based method as claimed in claim 30 wherein said acquiring operation comprises:

defining a wireless service area of said wireless communication network approximately corresponding to said service area of said PSAP;

locating RF coverage holes within said wireless service area, said RF coverage holes being regions of said wireless service area that exhibit a signal strength of RF communication signals that is less than a predetermined design threshold; and

dissociating said RF coverage holes from said wireless service area to produce said second map of said RF coverage area.

32. A computer-based method as claimed in claim 30 wherein:

said method further comprises:

establishing an RF signal propagation model of said wireless communication network in said validation region map, said model representing propagation of RF communication signals through said validation region;

activating said ALI system within said simulated environment; and

locating said test point in said validation region map, said ground truth being determined from said validation region map; and

said performing operation comprises simulating said test call within said simulated environment to obtain said reported location.

33. A computer-based method as claimed in claim 30 further comprising executing said choosing, determining, performing, obtaining, and comparing operations for a plurality of test

points exhibiting said unique environment represented by said one test scenario class.

34. A computer-based method as claimed in claim 30 further comprising:

selecting a second one of said plurality of test scenarios that represents a second unique calling environment in which said emergency call may occur;

choosing a second test point in said validation region exhibiting said second environment represented by said second test scenario; and

executing said determining, performing, obtaining, and comparing operations for said second test point.

35. A computing system for selecting test points in a validation region, said test points being used to validate accuracy of an automatic location identification (ALI) system operating in said validation region, said ALI system being configured to locate a wireless communication device originating a call through a wireless communication network, said computing system comprising:

a processor;

a computer-readable storage medium; and

executable code recorded on said computer-readable storage medium for instructing said processor to select said test points, said executable code including:

a validation region map subprocess for forming a validation region map of said validation region, said validation region map representing an overlap of a service area of a public safety answering point (PSAP) and a radio frequency (RF) coverage area of said wireless communication network;

a sub-region classification subprocess for partitioning said validation region map into a plurality of sub-regions and correlating each of said sub-regions with one of a plurality of test scenarios, each of said test scenarios representing a unique calling environment in which said call may occur; and

a test point selection subprocess for choosing said test points in response to a selected one of said test scenarios, said test points exhibiting said unique calling environment represented by said selected one of said test scenarios.

36. A computing system as claimed in claim 35 wherein said validation region map subprocess contains instructions for:

accessing a PSAP service area database to obtain said service area of said PSAP;

accessing a service area database of said wireless communication network to define a wireless service area of said network approximately corresponding to said service area of said PSAP;

accessing an RF coverage area database to identify said RF coverage area within said wireless service area, said RF coverage area being a portion of said wireless service area that exhibits RF signal strength of said RF communication signals that is greater than said predetermined design threshold;

querying each of said PSAP service area database, said wireless service area database, and said RF coverage area database to compile unit areas to form said validation region map, said unit areas being common to each of said service area of said PSAP, said wireless service area, and said RF coverage area.

37. A computing system as claimed in claim 35 wherein said sub-region classification subprocess contains instructions for populating said validation region map with geographic and land use features of said validation region to form said unique calling environments represented by said test scenarios.

38. A computing system as claimed in claim 35 wherein said test point selection subprocess contains instructions for initiating a random selection process to choose said test points from a plurality of points positioned within said sub-regions correlated with said selected test scenarios.

39. A computing system as claimed in claim 35 wherein said call is an emergency call and said a test point selection subprocess contains instructions for distinguishing said test points in response to a frequency of wireless emergency calls previously originated within a boundary of one of said sub-regions correlated with said selected test scenario relative to said frequency of said wireless emergency calls previously originated within others of said sub-regions correlated with said selected test scenario.

40. A computing system as claimed in claim 35 wherein said call is an emergency call and said a test point selection subprocess contains instructions for distinguishing said test points in response to a frequency of wireless calls previously conducted within a boundary of one of said sub-regions correlated with said selected test scenario relative to said frequency of said wireless calls previously conducted within others of said sub-regions correlated with said selected test scenario.

41. A computing system for selecting test points in a validation region, said test points being used to validate accuracy of an automatic location identification (ALI) system operating in said validation region, said ALI system being configured to locate a wireless communication device originating an emergency call through a wireless communication network, said computing system comprising:

a processor;

a computer-readable storage medium; and

executable code recorded on said computer-readable storage medium for instructing said processor to select said test points, said executable code including:

a validation region map subprocess for forming a validation region map of said validation region, said validation region map representing an overlap of a service area of a public safety answering point (PSAP) and a radio frequency (RF) coverage area of said wireless communication network;

a sub-region classification subprocess for partitioning said validation region map into a plurality of sub-regions and correlating each of said sub-regions with one of a plurality of test scenarios, each of said test scenarios representing a unique calling environment in which said emergency call may occur; and

a test point selection subprocess for choosing said test points in response to a selected one of said test scenarios, said test points exhibiting said unique calling environment represented by said selected one of said test scenarios.

42. A computing system as claimed in claim 41 wherein said validation region map subprocess contains instructions for:

accessing a PSAP service area database to obtain said service area of said PSAP;

accessing a service area database of said wireless communication network to define a wireless service area of said network approximately corresponding to said service area of said PSAP;

accessing an RF coverage area database to identify said RF coverage area within said wireless service area, said RF coverage area being a portion of said wireless service area that exhibits RF signal strength of said RF communication signals that is greater than said predetermined design threshold;

querying each of said PSAP service area database, said wireless service area database, and said RF coverage area database to compile unit areas to form said validation region map, said unit areas being common to each of said service area of said PSAP, said wireless service area, and said RF coverage area.

43. A computing system as claimed in claim 41 wherein said sub-region classification subprocess contains instructions for populating said validation region map with geographic and land use features of said validation region to form said unique calling environments represented by said test scenarios.

44. A computing system as claimed in claim 41 wherein said test point selection subprocess contains instructions for initiating a random selection process to choose said test

points from a plurality of points positioned within said sub-regions correlated with said selected test scenarios.

45. A computing system as claimed in claim 41 wherein said a test point selection subprocess contains instructions for distinguishing said test points in response to a frequency of wireless emergency calls previously originated within a boundary of one of said sub-regions correlated with said selected test scenario relative to said frequency of said wireless emergency calls previously originated within others of said sub-regions correlated with said selected test scenario.

46. A computing system as claimed in claim 41 wherein said a test point selection subprocess contains instructions for distinguishing said test points in response to a frequency of wireless calls previously conducted within a boundary of one of said sub-regions correlated with said selected test scenario relative to said frequency of said wireless calls previously conducted within others of said sub-regions correlated with said selected test scenario.